Naval War College Review

Volume 42
Number 3 *Summer*

Article 2

1989

The Coming Explosion of Silent Weapons

Stephen Rose

The Coming Explosion of Silent Weapons

Commander Stephen Rose, JAGC, U.S. Navy

Twenty years ago the United States unilaterally disbanded its biological warfare program. According to the wisdom of that time, germs and toxins were crude, uncontrollable weapons of little military value.[1] In recent times, however, analysts have begun to warn that biological agents are now poised to become flexible weapons perhaps "even more dangerous" than nuclear arms.[2] What has led to this complete turnaround in analytical thinking within the span of two decades?

The answer lies in the revolution in biotechnology, especially in genetic engineering, that began during the 1970s. Recently developed techniques permit the manipulation of key biological processes with a precision and power not dreamed of 20 years ago. Gene-splicing allows the transfer of toxic features from one biological agent to another. Science can now reshuffle the genetic deck of micro-organisms to produce a theoretically unlimited number of combinations, each with its own unique blend of toxicity, hardiness, incubation period, etc. In short, it is becoming possible to synthesize biological agents to military specifications. Thus, the world lies on the threshold of a dangerous era of designer bugs as well as designer drugs.

As if this were not concern enough, two additional factors serve to amplify the impact of this revolution on the military. First, the new biochemical processes are relatively cheap, easy to master, and accessible to all. This allows many more players to enter the arena of biochemical warfare, ranging from superpowers to Third World states to terrorist groups.

Commander Rose was graduated with honors from Yale University and received his juris doctor degree from the University of Virginia Law School. A former naval aviator and, in 1989, a graduate of the Naval War College, Commander Rose is currently the Force Judge Advocate for Commander, Naval Air Force Atlantic.

This article (under another title) received both the Joint Chiefs of Staff and the Naval War College's Richard G. Colbert prize essay awards.

Second, the new technology inherently favors offense over defense. Although strengthened by a million years of evolution, the human organism remains vulnerable to biochemical assault. Several of the new supertoxins are ten thousand times more potent than nerve gases now held in military arsenals. One author estimates that "nerve gas, which has created a worldwide furor, is mere perfume compared to some agents on the drawing board."[3] Even more sobering is the emerging possibility for designing organisms which resist all known treatment and which might take years to counter. The potential scope of this problem is illustrated by the billions of dollars and years of effort already expended to discover a defense against a naturally occurring biological phenomenon—the AIDS virus.[4]

As novelists are fond of reminding us, biotechnology could conceivably unleash the equivalent of a homemade "Andromeda strain"—a pathogen so demonic that it would result in global catastrophe. In the judgment of most knowledgeable experts, however, the more realistic threat lies in gene-splicing's powerful ability to recombine bits and pieces of known organisms in a nearly limitless array. As one government official described the problem, "new [biological warfare] agents can be produced in hours; antidotes may take years."[5]

The Pressures and Perils of Proliferation

A key aspect of this emerging technology is that weapons of mass destruction threaten to become commonplace. We are crossing into an era when tiny nations and terrorist groups can arm themselves with biological and chemical weapons of great destructiveness—the equivalent of the "poor man's atomic bomb."

For example, Moammar Qadhafi has long sought a nuclear capability for Libya, but thus far without apparent success. Recent reports suggest, however, that Libya is now developing both biological and chemical weapons.[6] Should his nuclear quest continue to be thwarted, it is likely that Qadhafi's long-touted "Moslem bomb" will be a biochemical weapon rather than an atomic one.

An estimated 10-20 other nations have biochemical weapons, and this number is expected to double in the coming decade.[7] While current technology permits even backward countries to achieve a quasi-nuclear status at bargain basement cost, the technological infrastructure required to develop an atomic weapon is far more complex and expensive than the effort needed to produce sophisticated biochemical weapons. The same processes used to make fertilizers and pesticides can also churn out poison gases; similarly, bulk toxins can be manufactured at a gene-splicing facility, at modest cost, and based on techniques freely available in the scientific press. Poor, nonnuclear nations caught up in a regional arms race or believing

themselves menaced by heavily armed neighbors are beginning to invest in biochemical weapons as a "cheap" but potentially nasty deterrent.[8]

In the decades ahead, it is likely that many additional nations will opt to acquire such arms. Proliferation of biochemical weapons is part of a broader cycle of global diffusion of political, economic and military power. As the international alignment continues to shift from a bipolar to a multipolar world, weapons of mass destruction will also spread. It is conceivable that by the turn of the century 35 nations will possess a stockpile of nuclear, chemical and/or biological weapons. Aside from placing many new fingers on the triggers of mass destruction, such a development would also diminish superpower freedom of action. As time passes, conclude the authors of a landmark report on *Discriminate Deterrence*, "[t]he arsenals of the lesser powers will make it riskier and more difficult for the superpowers to intervene in regional wars."[9] With the spread of biological and chemical weapons, even small nations will gain the capacity to mete out punishing counterstrokes to an intermeddler.

The good news is that none of the Third World countries suspected of developing biological weapons has, thus far, turned to genetic engineering to create novel organisms.[10] The not-so-good news is that at least a dozen countries are hard at work on toxins and chemicals. The bad news is that many of them, particularly in the Middle East, are actively shopping for missiles and other delivery systems to extend the reach of their new biochemical arsenals. The worse news is that the 50-year tradition of not using biochemical weapons in battle has collapsed in the past decade during a series of regional conflicts. Worst of all, the lesson demonstrated to many by Iraq's use of poison gas against Iran is that the military benefit gained by Iraq substantially outweighed any price paid in terms of international censure or economic sanctions.

Widespread use of chemical poisons in the Iran-Iraq war may have lowered the threshold for future use of biological weapons as well. This erosion of ancient taboos is being accelerated by the new biotechnology, which not only blurs the distinction between biological and chemical processes, but also provides a framework for controlled biological warfare. Thus, the proliferation of biochemical weapons gathers momentum from three trends—a search for economical deterrence, the weakening of old taboos, and the advent of a new and powerful technology ripe for exploitation.[11] In short, some countries are beginning to view biochemical weapons as both useful and, under certain circumstances, usable.

Nations of the Middle East are a case in point. The current scramble for chemical armaments in this region adds a dangerous twist to an already volatile situation. In the estimate of CIA Director William Webster, "the spread of chemical weapons among the Arab states, principally Iraq, Libya

and Syria, could seriously alter the regional balance of power."[12] This threat will intensify as countries obtain quantities of missiles capable of delivering biochemical warheads throughout the region.

Thanks to Soviet largesse, the Syrians already have a supply of SS-21 missiles capable of sending warheads into neighboring states with considerable accuracy.[13] During the Gulf War, Iraq successfully managed to modify a number of short-range Scud-B missiles, tripling their reach to nearly 600 miles. With help from Iraq, Egypt is reported to be hard at work building the Badr-2000, which will have a range comparable to the modified Scud.[14] Finally, Israel served notice with the September 1988 launching of its first satellite that it too has the technology to deliver advanced ballistic payloads.[15]

For decades Israel and its Arab neighbors have circled each other like proverbial scorpions in a bottle. As biochemical warheads continue to spread through the Middle East, this analogy becomes increasingly apt. Virtually every city in the region will be exposed to the sting of a formidable and potentially lethal attack.

In the past, Israel has enjoyed a regional monopoly over weapons of mass destruction. The one direct challenge to its presumed nuclear stranglehold—Iraq's effort to build an atomic weapon in the late 1970s—ended in the bombing of the main Iraqi research reactor in 1981. Similar preemptive strikes would be less useful to curb the spread of biochemical weapons. "If a country is serious about acquiring chemical weapons, it is hard for another country to eliminate that capability the way Israel knocked out Iraq's atomic bomb program," concludes one analyst. "These weapons can be made and stored in small sites all over a country, and you can never be sure you got them all."[16]

This is equally true for biological and toxin weapons. Like their chemical cousins, these agents can be prepared and stored in a small facility at relatively little capital investment. A batch of anthrax capable of killing millions of people, for example, can be concocted in a "room the size of a broom closet."[17]

Although the present furor over the Middle East balance of power centers on chemical agents, in time the biological side of the spectrum will be viewed as even more insidious and destabilizing. Chemical weapons, in comparison, are crude. Despite their lethal effect, chemicals require bulk application to qualify as a true weapon of mass destruction. The nerve gases in modern arsenals are, essentially, refined versions of agents developed prior to World Wars I and II. While some additional refinements can be expected, pure chemical agents are approaching the end of their evolutionary path. The menace of the future lies in biologicals—pathogens and toxins—which, thanks to the advancing power of genetic engineering, have a far richer potential for harm. If the proliferation of poison gas in the 1990s creates

a decade of chemical concerns, the largely untapped, but nearly unlimited nature of this new biotechnology will threaten to turn the next century into a diabolic era of military biology.[18]

The Soviet Perspective

The Soviet Union has long treated the entire gamut of biochemical weapons as a valuable adjunct to their overall war-fighting capability. Military implications of the biotechnological revolution have not escaped their notice. The magnitude of the Soviet effort to tap the dark side of this new technology is demonstrated by the existence of at least seven highly secure biological warfare centers under military control in the U.S.S.R.[19]

The scope of this program is mirrored by the multiple uses for which their biological and chemical arsenal is intended. In general, the Soviets consider these weapons to be excellent tools for sabotage and interdiction. Their doctrine emphasizes the need to prevent an enemy from effectively marshalling his forces. If the Soviets were to use biochemical weapons during an attack on NATO, a likely target cluster would be rear-area chokepoints such as airfields, supply dumps, headquarters, and port facilities.[20] The vulnerability of these sites is presently amplified by NATO's inability to mount like-kind biochemical strikes against similarly valuable targets in the rear of the Warsaw Pact.[21]

Another Soviet scenario for biochemical use envisions an attempt to impair NATO's resolve to shift to a wartime posture. "As an opening salvo," suggests Joseph Douglass, "the Soviets might well initiate a massive covert C/B war that could confuse the leadership of the Western alliance and distract their attention away from even more critical events."[22] As Soviet writers have already noted, governments which are preoccupied with widespread civilian panic on the home front could suffer a crucial loss of time, will and coordination during the run-up period before conventional hostilities.[23]

On an even grander scale, the U.S.S.R. may view their biochemical capability as a strategic lever to offset American advances in other technologies. According to one recent report, there is some official indication that Moscow "might retaliate against an American Star Wars defense system not with new missiles, but with germs."[24] As early as 1987, Valentin Falin, then head of the Soviet Novosti Press Agency, let slip the following comments about Moscow's possible response to SDI: "We won't copy you anymore, making planes to catch up with your planes, missiles to catch up with your missiles. We'll take asymmetrical means with new scientific principles available to us. Genetic engineering could be a hypothetical example. Things can be done for which neither side could find

defenses or countermeasures. . . . These are not just words. I know what I'm saying."[25]

At the other end of the weapons spectrum, the Soviets have also begun to tailor biochemical weapons for purely tactical use on a limited scale. Several years ago the world was caught up in a heated controversy over "yellow rain"—ignited by U.S. charges that Soviet-supplied forces in Laos and Kampuchea were using fungal toxins as a weapon against rebellious tribespeople. In 1982 the State Department issued several reports marshalling the evidence for yellow rain and estimated that use of this bioweapon in Southeast Asia had already led to 7,500 deaths.[26] Although many reporters and scientists continue to voice skepticism,[27] to this day the State Department has not withdrawn or softened its charges. The yellow rain dispute demonstrates how easily bioweapons can fade into ambiguity. As Stuart Schwartzstein observed, "there are great advantages in using weapons that are either very subtle . . . or where verification and identification is so difficult that arguments continue to rage over whether or not allegations of use are true."[28]

Although the Soviets are also alleged to have used yellow rain during their occupation of Afghanistan, they seem to have experimented with a new kind of biochemical agent as well. Reports from the Mujahidin rebels referred to a toxin spray known as "black rain," which incapacitated people so quickly that they were frozen in place, unaware until regaining consciousness many hours later that they had in fact been attacked and immobilized.[29]

A common denominator of all these examples is the breadth and versatility of Soviet biochemical capability and doctrine. For them, it is a flexible and powerful tool—a frontline rapier as well as a global blunderbuss. As John Hemsley sizes up the situation, "it would appear that the Soviet High Command considers that current developments in novel CB agents . . . [are] leading to a quantum, rather than an incremental, change in the nature and practice of war."[30] In contrast, the NATO/U.S. approach to biochemical weapons continues to suffer from an inherently defensive and makeshift posture which treats these weapons as an abhorrent deterrent to be kept, as much as possible, out of sight and out of mind.

Military Utility of Biological Weapons

To what extent do these developments, especially those arising from the revolution in biotechnology, require a shift in American military preparations? Not surprisingly, reasonable minds differ as to the strategic and tactical implications of genetic engineering. A key issue is the "usability" of biological agents.

One school of thought suggests that there may be less to the new developments in life science than meets the eye. It judges that biotechnology "will not lead to the 'ideal' BW or routinize biological warfare. That would require a higher level of protection and predictability than is likely ever to be possible. Effective weapons will always pose deadly risks for their maker. And no realistic genetic transformation will yield biological weapons that are suitable for theater operations."[31] In other words, science might well make biological warfare more dangerous, but never sufficiently controllable. Thus, the very nature of bioweapons induces self-deterrence, both now and for a long time to come.

Other thinkers view the situation as more threatening. From their perspective, controllability may not be an insoluble problem. Already, "in the case of biological agents . . . it is now possible to eliminate undesirable side effeets . . . [to] preserve and package agents more effectively . . . to do more and do it safely."[32] In the future, the phenomenal versatility of genetic engineering could enable an attacker to retain control over its biological agent, for example, "by designing it to . . . die off after a previously determined number of cell divisions . . . [or] by designing the organism to be bound by a narrow set of environmental factors."[33]

The mysteries of biotechnology have just begun to be probed, and at their core lie the basic secrets of life. According to many scientists, the next major exploratory step will be to map the human genome—a ten-year, $3 billion effort to determine the exact location, function and molecular structure of the 50,000 genes that human cells have in common. Human genes are the memory bank for our species—the cell's floppy disk governing all life processes at the molecular level. Precise mapping of such genetic blueprints, whether for human beings or other organisms, would greatly enhance the reach and sophistication of genetic engineering. Thus, as science marches on, the potential for controllable biological warfare will also advance and should not be discarded out of hand as a dead issue.

In practical terms, this means that all dimensions of potential biological warfare—strategic and tactical, overt and covert—must be monitored with great care.

Overt Strategic Use of Biological Weapons. The traditional scenario for germ warfare envisions an attack resulting in massive civilian casualties—devastation on a scale similar to the destructive power of nuclear weapons. Biological weapons have been viewed as inherently strategic in nature, and U.S. policymakers have assumed that a biological attack on a nuclear-armed nation could be countered with (and thus deterred by) another available weapon of mass destruction, i.e., nuclear arms. Therefore, when President Nixon dismantled our biological warfare program in 1969, he did not worry

about the disappearance of a like-kind retaliatory capacity. Three years later, similar considerations led the United States to support a sweeping arms control ban on biological weapons, even though the agreement lacked any procedures for verification. At that time, overt biological warfare was correctly viewed as a clumsy, indiscriminate weapon, an all-or-nothing proposition allowing no tactical finesse or useful strategic advantage.

In part, the rationale of the Nixon era still makes sense. Nuclear deterrence continues to restrain superpower use of biological agents against another superpower.[34] In the words of a former director of a Defense Department laboratory responsible for identifying such agents: "one of the most awesome tasks I can think of [is] coming up with a definitive statement that we've been attacked with a biological weapon, knowing that that statement is probably equivalent to pushing the [nuclear] button. [The President] could always call the Kremlin and ask 'What the hell did you do that for?' My guess is he wouldn't. He'd tape that message to the front end of a Minuteman missile."[35]

Embedded in this scenario are the key assumptions that use of a biological agent would be both traceable and massive enough to qualify as a strategic threat. In times past, the relatively primitive nature of biological weapons made both assumptions nearly axiomatic. The new biotechnology complicates this old equation, however, by opening up novel possibilities for tactical and covert uses of biological agents.

Overt Tactical Use of Biological Weapons. One potential use of genetic engineering is the mass production of toxins, which are poisons made by organisms. Toxins occupy an interesting niche between biological and chemical weapons—more potent than most man-made poisons, but also more controllable than living agents. Until now, the availability of toxins has been limited by a production bottleneck. Large numbers of creatures and expensive, laborious processes were needed to yield even small quantities of toxin. For example, using refinement techniques available during the late 1960s, the U.S. government generated only 11 grams of shellfish toxin from several tons of mussels. Biotechnology changes all this.

With gene-splicing, micro-organisms can now be converted into miniature poison factories, permitting the production of militarily significant amounts of toxins at far less cost and effort. Soviet use of "black rain" in Afghanistan, believed to be a form of toxin causing one-breath anesthesia, illustrates the tactical potential of such agents. According to an official U.S. study, the Soviets are pursuing development of a broad spectrum of natural and synthetic toxin weapons, ranging from extraordinarily lethal agents to those which merely induce sudden panic, listlessness, or sleepiness.[36]

The obvious and chilling threat of lethal agents tends to divert our attention from problems posed by incapacitants. These nonlethal toxins

could have a disproportionate impact, however, due to the natural reaction of the people who are unaffected to assist the stricken. In Douglass' estimate, incapacitants "can be militarily more effective [than lethal agents] because sick or disabled soldiers and dependents tie up scarce resources, demand the energies of those still healthy, and have a very demoralizing effect."[37] The crucial point is that toxin weapons can theoretically be tailored to create a wide variety of effects, depending on the tactical need.

Covert Use of Biological Weapons. In the 1970s, Cuba charged that the CIA was clandestinely using biological agents to try to destabilize the island.[38] Allegedly, this campaign targeted vital crops such as tobacco (blue mold) and sugar cane (cane smut), livestock (African swine fever), and also the populace itself (hemorrhagic strain of dengue fever).[39] Whatever the source, these outbreaks cost Cuba several billion dollars and 300,000 cases of debilitating disease. The Cuban charges highlight several reasons why covert biological warfare is such a potential menace—the difficulty of proof, the range of potential targets, and the substantial damage that can be inflicted by relatively cheap and easily concealed agents.

None of these problems is new. Even before the advent of genetic engineering, nations had at their disposal some nasty means for biological sabotage. Nature is a veritable cornucopia of pathogens and maladies. The biological revolution, however, expands both the size of the chessboard and the power of the pieces available for such covert operations.

As previously discussed, the potential number and potency of these biological "chess pieces" has increased dramatically due to gene-splicing's capacity for reshuffling the genetic deck in a controlled way. Nature no longer sets the upper limit for either variety or virulence; and as genetic engineering increases in sophistication, so too will the subtlety and scope of covert biological weapons. If (when) a devastating new strain of wheat rust or pesticide-resistant fruit fly or AIDS-like virus pops up in America's future, will we be able to determine whether the source is a natural mutation or a genetic manipulation concocted by an adversary? Granted, these hypothetical examples seem more a product of science fiction than reality; however, judging from advances made in genetic engineering in just over a decade, science appears to be eclipsing fiction more rapidly than expected.

Quo Vadis?

As the preceding discussion suggests, a number of factors—including regional conflicts, Soviet capabilities and the revolution in biotechnology—are converging to usher in an era of soft but deadly weapons. This threat, which has grave implications for American security, is here now and will

grow progressively worse.[40] What can the United States do? There are three basic approaches: status quo; patchwork; and aggressive defense.

Status Quo. America's current biological warfare doctrine involves two tracks: a defensive posture (no stockpile of bioweapons) and deterrence (possible nuclear escalation in response to biological attack). The status quo approach would leave matters as they are. Unfortunately, recent advances in biotechnology seriously weaken both prongs of this doctrine.

As we have already seen, the traditional notion of treating military biology as a weapon of only strategic significance no longer seems to be valid. When such weapons were an instrument of relatively uncontrollable mass destruction, it may have been apropos to threaten nuclear retaliation in response to an outbreak of plague warfare. But now that the tactical possibilities of bioweapons are beginning to emerge, this deterrent linkage is not as seamless and credible as it once was.

Would we go nuclear, for example, in response to the use of "black rain" or a biological warfare campaign in Europe that sickened but did not kill the populace? Without the capacity for like-kind retaliation (as called for by U.S. chemical warfare doctrine), there is a policy/force mismatch that invites mischief and miscalculation. As former Senator John Tower wrote in 1982, when arguing the need for a robust U.S. chemical weapons capability, "the idea that we can credibly threaten to respond to a Soviet first-use of chemical weapons [during an attack on NATO] by resorting to nuclear retaliation should be as preposterous to the Soviets as it must be appalling to West Europeans."[41]

Similar pejoratives apply to the gap now opening up between American deterrence policy and the expanding world of bioweapons. Our nuclear umbrella cannot credibly deter tactical use of toxin or other limited biological agents any more than it can deter chemical strikes. As biological warfare techniques and agents continue to evolve, becoming more and more "discriminate" as well as harder to detect, the problem of finding a range of credible and proportional deterrents will also grow.

The other prong of the U.S. biological warfare posture—defense but no offense—is grounded on adherence to the 1972 Biological and Toxin Weapons Convention, which bans possession of all biological and toxin agents except for small stocks retained solely for defensive research. Prior to the biotechnological revolution, this made some sense as a useful firebreak, because the biological agents and processes then in existence were relatively unwieldy and unreliable.

The new technologies, however, have potentially converted biological warfare from a major undertaking into a cottage industry—simple, cheap, quick, precise. Distinctions between research and production, between defense and offense, are now essentially meaningless. Counting missiles in

their silos is child's play compared to tracking the thousands of facilities which could be used to produce biological warfare material.

By their very nature such facilities are quite difficult to detect using standard technical means of verification, i.e., surveillance satellites and ground monitoring stations. "Unlike high energy physics experiments or the construction and testing of weapons delivery vehicles," notes John Birkner, "new biotechnology research efforts devoted to military objectives would tend not to reveal themselves."[42] Also, advances in bioprocessing technology made during the past decade have magnified the detection problem by scaling down the size of facilities needed to produce militarily significant amounts of biological agents. A verification procedure designed to cope with these problems—the 1972 Convention having no such provisions whatever—would have to be extraordinarily intrusive. Since the step from research to production could be quite rapid, a comprehensive inspection regime might, as one director of a research institute glumly noted, "have to inspect the lab notebooks of every [biological] lab in the country."[43]

Summing up these concerns, the DoD official then in charge of negotiations policy, Douglas Feith, told Congress in 1986 that the 1972 Biological and Toxins Weapons Convention "must be recognized as critically deficient and unfixable."[44] Labeling the Convention a "false advertisement to the world," Feith went on to explain that the primary culprit was the revolution in biotechnology. "Because new technology makes possible a massive and rapid breakout, the treaty represents an insignificant impediment at best." He concluded by suggesting that this potential for a quick breakout made the notion of a biological warfare treaty fundamentally unworkable. "Its principal failing, therefore, is no longer the absence of verification provisions or lack of effective compliance mechanisms, the commonly acknowledged shortcomings, but its inability to accomplish its purpose." Feith ended his remarks with the following pessimistic appraisal: "It is not a pleasant task to deliver so dismal a report to the Congress. . . . But can one responsibly inflate hope for an escape from the military problems posed by the Soviet BW programs? There can be no *deus ex* arms control in this arena. In answer to those who crave a constructive suggestion under even the least promising circumstances, one can recommend only: Defense."[45]

Overall, then, the status quo approach rests on two flawed premises—that the biological warfare genie can be kept on a tight leash through arms control and that bioweapons can otherwise be held in check by strategic deterrence. Both prongs invite more risk than seems prudent under the circumstances.

A Patchwork Quilt. This approach seeks to contain the biochemical problem via the cumulative effect of several interlocking initiatives: economic sanctions, export controls, an augmented defensive capability, and participation in arms control negotiations.

Sanctions. During the Reagan administration, other aspects of American policy clearly took precedence over a perceived need to keep the biochemical genie bottled up. Between 1986-88, for example, when Iraq was using mustard and nerve gas to break up human-wave assaults during its touch-and-go war with Iran, the United States basically turned a blind eye to this breach of the biochemical taboo. Later, Iraq began to use similar agents to settle a long-standing feud with Kurdish rebels, and several nations called for tough trade sanctions. After some dithering, the Reagan administration came out in opposition to sanctions against Iraq,[46] and proponents eventually settled for diplomatic protests.

"The fundamental question," as John Kester sees it, "is whether . . . use [of biochemical weapons] by anyone will carry a real penalty—economic, political and perhaps military—even if enforcement injures Western economic or short-term political interests."[47] Thus far, developed nations have not been willing to stomach more than a taste of the required medicine, and during the past few years the United States has sadly been among the reluctant.

Export Controls. The U.S. track record regarding export controls is more favorable. In 1984 the Reagan administration began to clamp down on the transfer of equipment and materials directly contributing to biochemical weapon programs in other countries. In the long run, this is probably a futile effort, since many of the items in question have dual use in paints, plastics and pharmaceuticals or are found in breweries, hospitals and pesticide plants. The unwelcome truth is that even if the United States imposes stringent export controls, too many other countries are willing to let their business firms peddle biochemical technology to a world of eager customers.

Arms Control. Under a patchwork approach, however, the time gained by these delaying maneuvers can be put to good use in trying to fashion a workable arms control regime for biochemical weapons. The expert consensus is that effective worldwide control of biological and chemical agents is probably a chimera, but nonetheless an effort worth making. For nearly 20 years diplomats at the Geneva Disarmament Conference have been searching for an acceptable formula that would lead to a comprehensive, verifiable and global ban on chemical weapons. As with biological agents, the main stumbling block to an effective chemical warfare treaty has been the bugbear of verification. According to William Burns, Director of the U.S. Arms Control and Disarmament Agency, "no country in the world has offered a system which has a reasonable chance of verification."[48]

Part of the problem is that chemical weapons can be produced by the same types of factories which turn common chemicals into fertilizers, pesticides and pharmaceuticals. Even more ominous, these plants can be switched from one production line to the other—from agents of well-being to agents of death—within a 24 to 48-hour period. Accordingly, a ban on chemical weapons would require continuous monitoring of some of the world's most basic industries. Although the Soviet Union and the United States have agreed in principle on the need for short-notice challenge inspections as part of any chemical warfare treaty, negotiations have bogged down on the inevitable issues of how, what, when and where. In addition, several major countries, primarily China and India, have not yet accepted the principle of on-site challenge inspections.[49]

A further complication is the recent Arab call for linking any ban on chemical weapons to progress in nuclear disarmament.[50] The heavy Arab investment in biochemical weaponry is intended, in part, to offset Israel's possession of nuclear arms. From the Arab perspective, a ban on chemical weapons appears to be discriminatory so long as Israel retains *its* weapons of mass destruction. Without Arab participation, a chemical warfare treaty would be stillborn—even if the verification quagmire could eventually be navigated.

This having been said, some kind of a chemical warfare convention will likely emerge from Geneva during the next few years. There is a growing consensus that even an imperfect ban would be preferable to the galloping proliferation now under way. As Brad Roberts puts it, "[t]he choice, practically speaking, will be between a partially disarmed world and a wildly proliferating world."[51] To wait is to court increasing danger, especially in the Middle East cauldron; to move too quickly, however, without first resolving key issues of verification and linkage, would be to indulge in an illusion of progress.

Defense. Total defense against biochemical weapons is as elusive as a totally verifiable ban. Even so, several steps can be taken to strengthen deterrence by creating uncertainty in the minds of potential aggressors about U.S. capability to fend off a biochemical attack.

- Increase intelligence efforts to determine the scope and degree of current and emerging biochemical threats. Resources currently assigned to this area are miniscule compared to those directed at fathoming nuclear threats. To the extent that nuclear forces have settled into a kind of floating gridlock, whereas the biochemical threat is gaining momentum, it seems prudent to begin to shift some intelligence assets.

The confusion surrounding the yellow rain controversy in Southeast Asia a few years ago illustrates how ill-prepared this country was to sort out and substantiate allegations of biochemical warfare. Experts still argue about

the source of yellow rain—whether people were stricken by natural toxins from bee waste or by a biological weapon in the hands of Soviet allies.

Judging from recent reports, the American intelligence community scored a notable success this past year in tracing the commercial origins of Libya's new chemical plant. One hopes that the current attention paid to biochemical "economics" is a sign that extra care and resources are also going to be funneled into biochemical "diagnostics."

By definition, most covert operations depend on secrecy, or at least plausible deniability, to be useful. One way to reduce the threat of covert biological warfare is to increase the counterthreat that clandestine attacks will be exposed and traced to their origins. Two basic means are available to enhance detection capabilities: better intelligence gathering with regard to adversary capabilities and intentions; and a well-funded program of bio-sensing research. Only a small fraction of DoD's allotment for military chemistry and biology is spent on coping with the biological threat; and of the money allocated to biology, only a tiny percentage goes to advanced bio-sensing and diagnostic research.[52] This should be remedied immediately in order to minimize the risk of undetected and undetectable biological warfare.

- Based on the intelligence yield, intensify biochemical research and development programs to explore all options for antidotes and protective vaccines and to maintain a plausible capability for fashioning a like-kind retaliatory response if required. There is an urgent need to guard against biotechnological surprise. According to the authors of the 1988 report on *Discriminate Deterrence*, "the Soviets are sure to stay well ahead in their research on chemical and biological weapons, where they have practically no U.S. competition."[53] This gloomy forecast may overstate the problem a bit, but it does suggest the magnitude of the gap between Soviet and U.S. programs. In 1988 the United States spent more to buy a single F-14D fighter than on its entire biological research and defense program.

In summary, the patchwork approach is a combination of modest but mutually supporting improvements. The overarching goal is to slow down proliferation of biochemical agents and discourage their further use, while at the same time buttressing deterrence and defense. There is no single solution to the menace of biological and chemical weapons. Export controls, economic sanctions, and international conventions all play roles in limiting the threat, but the biochemical maze does not offer an easy exit, either nationally or internationally.

Aggressive Defense. A more forceful approach might involve preemptive strikes to prevent biochemical attacks on the United States or its allies. The controversy surrounding Libya's chemical plant at Rabta highlights the pros and cons of such action.[54] International law does not forbid the construction

of a chemical weapons facility. The 1925 Geneva Convention prohibits "use" of chemical weapons, but not their manufacture or possession. Realistically, the United States is concerned about Colonel Qadhafi's track record of extremism which makes his possession of chemical arms a threat *per se*.

The saber-rattling of the last days of the Reagan administration, during which Washington raised the prospect of a military strike against the Rabta plant, appears to have had three objectives: to put Qadhafi on final notice; to seize the lead and perhaps dampen any Israeli enthusiasm for an independent strike; and to impress on our allies the urgent need for export controls and vigilance to slow down biochemical proliferation. For now, the prevailing consensus within the U.S. government seems to be that, absent actual injury to our interests or at least hard intelligence that injury is imminently threatened, there is no clear legal justification for attacking the Libyan plant.[55]

One risk, of course, is that Qadhafi might opt to produce and stockpile large quantities of "pharmaceuticals" prior to distributing or employing them. Once such weapons are dispersed, a preemptive strike loses some of its value. This is especially true if biological agents are involved. In fact, a preemptive strike on a bioweapons workshop, if it broke open secure containment facilities without exterminating the pathogens inside, could precipitate, rather than prevent, a catastrophe.

By its very nature, military preemption is a weapon with limited reload capacity. Unless a nation cares little about its international reputation, preemptive attacks are usually reserved for situations posing clear, immediate and substantial danger. The Libyan plant at Rabta—capable of producing both medicine and military weapons; legal according to international norms but perceived to be a grave threat; built with Western connivance in pursuit of short-term profits at the risk of long-range perils—this one plant symbolizes the confusion and cross-currents that exacerbate the biochemical problem. Threats of a preemptive strike may help to keep Colonel Qadhafi in check, but preemption is obviously no solution to the larger issues posed by biochemical proliferation.

The Orphan Threat

Even if all the recommended steps were implemented, one more change would still be necessary. Our country's biochemical effort needs to become less an Army program and more of a national one. As the organization most likely to come face to face with a biochemical threat, the Army has had the lead for over 50 years. Now that the biochemical problem is snowballing, it is time for a multidisciplinary, multiagency effort. In the recent judgment of the Army's Science Board, "essentially little attention has been given

by the Army in its biological defense programs as to how modern biotechnology might be used by potential adversaries."[56]

This is a dangerous state of affairs, yet somewhat understandable. Biochemical agents do not have a natural constituency within the military. Service members are reluctant to become involved with "soft" weapons. The paradigm of a weapon seems to be a platform bristling with firepower—and tomorrow's version will be bigger, faster and more powerful. Bugs and drugs are headed in the opposite direction: smaller, more covert, and increasingly repugnant. More to the point, the services themselves are leery of diverting resources from the weapons systems they prefer to the dismal world of biochemical agents, especially since the ramifications of this threat extend well beyond traditional service functions and forces.

Accordingly, the real force structure needed to cope with this expanding problem is an infrastructure that incorporates elements from DoD, the FBI, the State Department, the National Institute of Health, and the Center for Disease Control. Possible formats might be a presidential advisory council, a National Security Council interagency group, or a joint agency patterned after the Defense Nuclear Agency. Paralleling the doctrine of combined arms, a multidisciplinary group of this sort would seek to counter the biochemical threat by force of combined brains.

A Glimpse of the Future

The outlook for biological weapons is grimly interesting. Weaponeers have only just begun to explore the potential of the biotechnological revolution. It is sobering to realize that far more development lies ahead than behind.

The modern battlefield is already, by design, an exceedingly dangerous place for human beings. Today's smart weapons will become the brilliant weapons of tomorrow; and future generations of "genius" weaponry lie below a not-so-distant horizon. The characteristics of such weapons will include a fire-and-forget mode, extended loiter capacity, micropropulsion, and enough true artificial intelligence to allow them to relentlessly hunt down individuals. Neural networks equivalent to the brain capacity of a bumblebee are already on the drawing board. Combine a refined version of this capability with advanced robotics, 10th-generation electronics and a shaped-charge or toxin "stinger," and there emerges the conceptual prototype of an "insect weapon" that could dominate the tactical battlefield of the next century. Today's RPV's could metamorphose into tomorrow's artificial killer bees.

Does this imply that the role of the human warrior is ultimately threatened? As a bearer of weapons, perhaps; as a director of weapons, no.[57] A human being in the loop will still be the key to battle, no matter how

lethal a battlefield becomes for living organisms. Despite predictable advances in robotics, artificial intelligence, and microminiaturization, a human being will long remain the most versatile, 100-gigabyte, mobile computer system that can be mass produced by unskilled labor.

So where does this leave bioweapons? Will they simply continue to be a wild card in the battlefield and force structure equation? The vision of an insect weapon described above arises from a view of the military future centered around hardware. Long before insect weapons become technically feasible, however, bioweapons may be able to achieve the same nasty results through gene-splicing and techniques yet to be developed. Even at the tactical level, precisely engineered microbes could turn out to be a more formidable threat than precision-guided munitions (PGMs).

Weaponizing the life sciences threatens to change a basic perspective of warfare. For centuries, the military's prime focus has been to marry its warriors to appropriate weapons. Conceptually, modern warriors still fight like their medieval counterparts—albeit with rifles instead of arrows, with tanks instead of horses, and with artillery and rockets instead of catapaults. The regime of soft weapons, bugs and drugs, weakens this bond and threatens to end-run the modern focus on weapons that rely on the application of brute force. The battlefield of today is, in essence, a high-explosive environment. The battlefield of the future may well end up being a hellish mix of high explosives (micro-nukes and PGMs), low explosives (beam weapons and rail guns) and no explosives (biochemical agents).[58]

Wars Hot and Cold

Soft weapons also circumvent current military operations in another fundamental way. An essential element of warfare is the ability to determine when one has been attacked. The use of a nuclear weapon, for example, is not likely to go unnoticed. This is not necessarily true of biological weapons.

An ominous new possibility is that attacks could be mounted which mimic natural phenomena so well that the onslaught may not be recognizable for what it is. Potentially, biological agents can be converted into the ultimate stealth weapons. The dark side of biotechnology enhances the opportunities for a kind of shadow war with no formal battlefronts and no detectable invasion.

One can analogize a nation's military forces to antibodies created by society to protect against, and deal with, external threats. But what if this protective "antibody" fails to recognize an invader or pinpoint the source? Invisible attacks of this sort represent the highest level of maneuver warfare. According to Jeremy Rivkin, "microbes are the foot-soldiers of the 21st

century."[59] More precisely, they threaten to become the elite saboteurs of the coming century. To the degree that hot wars grow increasingly impractical, the surreptitious and protean nature of soft weapons will unfortunately encourage their use as an extension of war by other means.[60]

The biotechnological revolution has unfolded dangerous new possibilities for converting the basic processes of life into weaponry. Still in its infancy, this revolution is likely to be a source of continuing surprises. From the standpoint of national security, the United States must track these developments closely to minimize the chance of a decisive trump card turning up in enemy hands. To paraphase Mao's well-known maxim, future power may come from the mouth of a test-tube as well as from the barrel of a gun.

Thus far, the national investment in biological defensive research has been a pittance compared to the expenditures made for traditional military systems. As discussed earlier, the deeper threat of biological agents lies not with formal use on a battlefield, but rather in their potential to become extraordinary weapons of stealth. Compared to the murky world of biological threats, nuclear weapons have an aura of refreshing clarity. Both types of weaponry pose grave dangers to U.S. security. Unfortunately, however, America's military ethos—centered around engineering, hardware, and firepower—makes it difficult for us to grasp the true strategic significance of soft weapons. Ironically, while the United States contemplates spending a sizeable part of its national treasure on SDI, comparatively few resources are being channeled to close a serious defensive gap now opening up along the biological frontier.

Our current international wrestling match over chemical weapons is only a forerunner of the far harder bout to come. A revolution in biology is liberating the life sciences and also unleashing the potential for bioweapons capable of nearly infinite refinement. Decisions made now, or evaded, about how to cope with the military implications of biotechnology, will cast a long shadow into the future. At present, the problem is comparatively small but it could easily cascade beyond control within a decade. Although the United States has begun to pay more attention to military biology in recent years, our overall stance still suggests a continuing inclination to whistle past the graveyard. If we fail to counter the expanding threat of biological warfare, someday this metaphor could take on a new and macabre meaning.

Notes

1. See Manfred Hamm, "Deterrence, Chemical Warfare, and Arms Control," *Orbis*, Spring 1985, p. 157.

2. Joseph Douglass, Jr., "The Challenges of Biochemical Warfare," *Global Affairs*, Winter 1988, p. 156.

3. Charles Piller and Keith Yamamoto, *Gene Wars* (New York: William Morrow, 1988), p. 113.

4. In 1987, the Soviets alleged that AIDS was created by an American biological weapon experiment gone haywire. Although no evidence has been offered to support this charge, some studies conclude that it would he possible to manipulate genes to interfere with the body's immune system. See Piller and Yamamoto, p. 97.

5. Douglas Feith, "Biological Weapons & the Limits of Arms Control," *The National Interest*, Winter 1986/87, p. 81. Feith served as deputy assistant secretary of defense for negotiations policy from March 1984 to September 1986.

6. Michael Gordon, "Libya Says It Can Make Chemical Arms If Others Do," *New York Times*, 10 January 1989, p. A12. Libya is reported to have a joint biological warfare program nnderway with Romania. See Joseph Douglass, Jr., "Soviets Surge in Biochemical Warfare; West Remains Drugged with Apathy," *Armed Forces Journal International* August 1988, p. 58.

7. John Fialka, "Chemical Weapons Spread in Third World, Pose Challenge to West," *Wall Street Journal*, 15 September 1988, p. 1; Lee Lescaze, "Qnest for Way to Block Biological Weapons Is Itself Called a Threat," *Wall Street Journal*, 19 September 1988, p. 1; Elisa Harris, "CBW Arms Control: A Regime Under Attack?" *Arms Control Today*, September 1986, p. 9. The following nations are reported to he either members of the chemical club or on the verge: United States, Soviet Union, France, Iraq, Iran, Egypt, Syria, Israel, Libya, North Korea, South Korea, Taiwan, China, South Africa, Romania, Czechoslovakia, Indonesia, Vietnam and Ethiopia. No nation admits to stockpiling biological weapons. Countries helieved to have the capacity for developing a bioweapon on short notice include the United States, Soviet Union, Iraq, Egypt, Iran, Israel, Syria, China and Romania.

8. Modern weapons and munitions are enormously costly, and very few countries have the resources to spend large sums developing and stockpiling arms. The more expensive war stays, the fewer the nations that can pose a conventional threat. Unfortunately, biological and chemical (B/C) weapons threaten a lot of destruction at relatively little cost. In the judgment of Robert Gates, the new Deputy National Security Advisor, "the most immediate threat to world peace may well come from the proliferatiou of chemical and biological warfare in the Third World." David Ottaway, "Middle East Weapons Proliferate," *Washington Post*, 19 December 1988, p. A11.

9. Fred Ikle, Albert Wohlstetter, eds., *Discriminate Deterrence: Report of the Commission on Integrated Long-Term Strategy* (Washington: U.S. Govt. Print. Off., 1988), p. 10.

10. John Cushman, "U.S. Cites Increase in Biological Arms," *New York Times*, 4 May 1988, p. A9.

11. A breakthrough in biology described as "the most significant technological event since the Industrial Revolution," Joseph Douglass, Jr. and Neil Livingstone, *America the Vulnerable* (Lexington, Mass.: Lexington Books, 1987), p. 3, will be difficult to ignore, either militarily or commercially. The genie of genetic engineering cannot be stuffed back into its bottle for two basic reasons. First, the logic of deterrence and counterdeterrence suggests that in a fearful world nations will tend to explore and, where practical, exploit new technology for military purposes—if only to forestall an adversary from gaiuiug an advantage.

Second, the commercial utility of genetic engineeriug continues to expand. As global oil supplies dwindle, the economics of production will gradually encourage chemical and pharmaceutical industries to use biotechnological methods in key production processes. As a result, even without overt military pressure, a vast reserviour of gene-cloniug expertise will build up. This commercial momentum means that "in the not-too-distant future, countries throughout the world will learn how to produce an enormous variety of large biological molecules, including toxins, on a scale that was previously inconceivable." Jonathan Tucker, "Gene Wars," *Foreign Policy*, Winter 1984-85, p. 65.

12. Ottaway, p. A4.

13. George Moffett, III, "Israel: Determined Not to be a Chemical Target," *Christian Science Monitor*, 13 December 1988, p. B15.

14. Ottaway, p. A4.

15. "Israeli Satellite Is 'Threat' Say Arabs," *Jane's Defense Weekly*, 1 October 1988, p. 753.

16. Fialka, p. 1, citing an uuidentified "U.S. government expert."

17. Dr. Robert Kupperman, quoted in William Rempel and Robin Wright, "How Spying, Analysis and Luck Provided Proof of Libyan Chemical Warfare Plant," *The Providence Sunday Journal*, 22 January 1989, p. A-8.

18. However, even if chemical weapons are just a harbinger of greater troubles to come, at present the main threat to Middle East stability appears to be chemical. With Israel holding an estimated 50-100 uuclear weapons and Arab adversaries beginuing to amass a significant number of deliverable chemical aud perhaps biological warheads, the region is entering a hair-trigger environment.

In essence, the Middle East is uudergoiug a shift from Israel's assured military superiority to a regime of reciprocal deterrence loosely equivalent to the U.S./Soviet notion of mutual assured destruction (MAD). Understandably, Israel views this turn of events with alarm and is currently mulling over whether to invest in an offensive or defensive strategy to deal with the new Arab threat.

The Middle East may simply he too volatile to permit transition to, much less maintenance of, a stable MAD equilibrium. Prime Minister Shamir and Defense Minister Rabin have already dropped strong hints that major chemical attacks against Israel would be met with a nuclear rather than chemical or conventional reply. (See Leonard Spector, "Nonproliferation After the Bomb Has Spread," *Arms Control Today*, December 1988, p. 10.) The proliferation of missiles and B/C weapons increases the chance of miscalculation by either side—and resurrects the possibility that Israel might take desperate retaliatory measures, such as using shaped nuclear charges to contaminate or even obliterate key oil fields upon which the wealth, and ultimately the military might, of the Arab bloc depends.

19. Feith, p. 82. See also Richard Wohl, "Biological Warfare: Advances Breed New Dangers," *Defense Science 2002+*, August 1984, p. 57. Another indicator of Soviet interest in B/C technology is that in recent years 70 percent of all Soviet requests for research papers made to American universities, research establishments and libraries have been on subjects involving chemical and biological engineering. See John Hemsley, *The Soviet Biochemical Threat to NATO* (New York: St. Martin's 1987), pp. 126-127.

20. The Soviets place a high priority on targeting an adversary's command and control apparatus. Although many of NATO's key C^3 sites have been hardened to offer some protection against conventional and even nuclear blasts, they remain relatively vulnerable to attack by B/C agents. As John Hemsley notes, "the problems associated with air-conditioning, limited capacities of closed-circuit systems, and staff shifts . . . [are] likely to become more accute with the introduction of 'novel' agents during the next decade." Hemsley, pp. 128-129. Hemsley is particularly concerned that the Soviets seem to be on the threshold of developing a new series of "penetrant and discipline breaker" agents which, in his judgment, will make "all hardened and static headquarters' sites especially vulnerable to CBW." *Ibid.*, p. 143.

21. Remedy of this deficiency will begin in 1990 when a new U.S. binary chemical bomb, the Bigeye, becomes available.

22. Douglass and Livingstone, p. 101.

23. Hemsley, p. 49.

24. See Lescaze.

25. Gary Thatcher, "Disease as an Agent of War," *Christian Science Monitor*, 15 December 1988, p. B10. It is also plausible, of course, that Falin's statement—far from being an unguarded comment—was a deliberate attempt to plant an idea intended to discourage SDI. Since then, there appear to have been no further open-source Soviet statements linking SDI and biotechnology. As John Hemsley points out, however, for reasons of economy "it could well prove that the Soviet Union sees biotechnologically derived 'designer' agents as the logical response to SDI." Hemsley, p. 48.

26. U.S. Dept. of State, *Chemical Warfare in Southeast Asia and Afghanistan*, Special Report no. 98 (Washington: March 1982) and U.S. Dept. of State, *Chemical Warfare in Southeast Asia and Afghanistan: An Update*, Special Report no. 104, November 1982. The government case was based on multiple information sources: testimony of victims and defectors, epidemiological data, analysis of medical samples, physical samples from attack sites, and intelligence data.

27. For criticism of the reliability of the government's evidence on yellow rain, see J. Robinson, "Chemical and Biological Warfare: Developments in 1983," in SIPRI, *World Armaments and Disarmament, SIPRI Yearbook 1983* (London: Taylor & Francis, 1984), pp. 336-338; S. Salaff, "Yellow Rain: Time for Re-evaluation," *Journal of Contemporary Asia*, v. 14, no. 3, 1984, pp. 380-395 and E. Guyot, "Yellow Rain: The Case is Not Proved," *The Nation*, 10 November 1984, pp. 465-484.

For alternative theories which explain yellow rain as a natural phenomenon, see M. Meselson, "The Search for Yellow Rain," *Arms Control Today*, September 1986, pp. 31-36; and L. Ember, "Yellow Rain," *Chemical and Engineering News*, 9 January 1984, p. 11.

28. S. Schwartzstein, "Statement," U.S. Congress, Senate, Committee on Foreign Relations, Subcommittee on Arms Control, Oceans, International Operations and Environment, *Yellow Rain: The Arms Control Implications*, Hearing (Washington: U.S. Govt. Print. Off., 1983), p. 109.

29. Douglass, "The Challenges of Biochemical Warfare," p. 159. See also U.S. Dept. of State, *Chemical Warfare in Southeast Asia and Afghanistan*, Special Report no. 98, March 1982.

30. Hemsley, p. 63; see also p. 23, n. 17, in which Hemsley cites N. V. Ogarkov, *Istoriya uchit bditelnosti* (Moscow: Voenizdat, 1985) for the proposition that the Soviets consider "modern forms of CBW . . . a quantum leap forward in the method of waging war."

31. Piller and Yamamoto, pp. 113-114.

32. Douglass, "The Challenges of Biochemical Warfare," p. 160. See also Wohl.

33. Piller and Yamamoto, p. 98, citing Raymond Zilinskas, "Managing the International Consequences of Recombinant DNA Research," Ph.D. dissertation, Los Angeles: Univ. of Southern California, 1981.

34. An interesting feature of biological warfare is the absence of realistic options for counterforce targeting. Germs and toxins attack people (or livestock, crops, etc.), but not an enemy's retaliatory capacity, either nuclear or biological. By itself, a traceable bioweapons attack is a perilous gambit: It

would serve to provoke an adversary without immediately disarming him. In a struggle between superpowers, the only practical value of a massive biological warfare capability is to provide limited insurance for the possible neutralization of one's nuclear arsenal. In other words, at the level of strategic interaction among the superpowers, *overt* biological warfare serves primarily as a back-up deterrent, and not as a first-strike weapon.

35. Piller and Yamamoto, p. 129, quoting David Kingsbury when he was director of the Naval Biosciences Laboratory in Oakland, California in 1984.

36. U.S. Congress, Senate, Committee on Armed Services, *Chemical Warfare Review Commission*, Staff Report (Washington: U.S. Govt. Print. Off., 1985), p. 118.

37. Douglass and Livingstone, p. 74. The Soviets are also reported to be working on quick-acting diseases, with an incubation period of a few hours, that could serve a tactical function. See Douglass, "Soviets Surge in Biochemical Warfare," p. 58; and Douglass, *America The Vulnerable*, p. 77.

38. Piller and Yamamoto, p. 72.

39. Military planners tend to evaluate biological agents almost exclusively in terms of their threat as antipersonnel weapons. Just as important, however, is biological warfare's potential for harming other life. For example, plants lack an immune system and are therefore especially vulnerable to biological attack. This susceptibility is magnified by the widespread use of monocultivation, i.e., the planting of genetically identical strains to boost crop yield, as an agricultural standard in Western countries. Monocultivation provides ideal targets for biological warfare.

40. Another possible source of a B/C threat inside American borders might be terrorism. Although terrorists have targeted American citizens and interests throughout the world, thus far relatively little activity has been reported within the United States. In addition, up to this time nearly all terrorist groups have relied on conventional weaponry to carry out their attacks.

Many experts believe terrorists have not yet turned to B/C weapons because potential drawbacks continue to outweigh expected benefits. (See Elliot Horwitz, "Terrorists and Chemical/Biological Weapons," *Naval War College Review*, May-June 1982, pp. 36-40; L. Paul Bremer, III, "High Technology Terrorism," *Dept. of State Bulletin*, July 1988, pp. 65-67.) The likely gains from a B/C attack resulting in mass casualties would be spectacular visibility and perhaps short-term bargaining power; the probable disadvantages would include deep public revulsion, a high risk of alienating key support groups, and an unleashing of extremely vigorous countermeasures. As Dr. Robert Kupperman, terrorism expert at the Center for Strategic and International Studies in Washington points out, government pursuit of bioterrorists would probably be relentless: "If terrorists start to use [biologicals], there is no end to which a nation would go to stop them." (Jeanne McDermott, *The Killing Winds* (New York: Arbor House, 1987), pp. 254-255.)

To some degree, terrorism is theater—a kind of psychodrama played out on the world stage with real victims to gain public attention for desperate causes. As Brian Jenkins sees it, "[t]errorists want a lot of people watching and a lot of people listening, not a lot of people dead." (Augustus Norton, "Terrorists, Atoms and the Future," *Naval War College Review*, May-June 1979, p. 42.) Of course, this logic holds only so long as the death of a few continues to be newsworthy. Some observers worry that after a decade of being exposed to terrorism based on conventional explosives, people are becoming "desensitized." (See Harvey McGeorge, "Reversing the Trend on Terror," *Defense & Foreign Affairs*, April 1988, p. 16.) Accordingly, as existing techniques begin to lose their propaganda punch, the temptation for terrorists to turn to more exotic and deadly means will grow. For this school of thought, the question is not whether B/C weapons will be used by terrorists, but only *when*.

Whatever their stance on the psychodynamics of terrorism, analysts generally agree on at least one point: the means to construct chemical or biological weapons are now within the grasp of many nonstate groups and, as time passes, the killing potential of these means will only expand. As previously discussed, many experts rely on a benefit-burden analysis to support their conclusion that terrorists are unlikely to resort to B/C agents. Unavoidably, such an argument pivots around the notion of a "rational" terrorist. There may be some freedom fighters who are not so calculating—those who, in a spasm of retribution, might seek to destroy what they cannot realistically hope to control. A terrorist group determined to inflict mass casualties (rather than just engage in theatrics) could well turn to B/C agents. The capability exists already. It seems inevitable that the international political climate will at some point be ripe to spawn an unholy trinity of bugs, drugs and thugs.

41. John Tower, "The Politics of Chemical Deterrence," *Washington Quarterly*, Spring 1982, p. 36. See also Maufred Hamm, pp. 127-128. In Hamm's judgment, "NATO has long relied in practice on the threat of nuclear escalation to deter Moscow from initiating chemical combat. But a nuclear response has always lacked credibility. . . . It can be all but ruled out that NATO's political leaders would muster the courage to permit the use of nuclear weapons to retaliate against chemical attacks or to transfer this decision to their military commanders in order to make the nuclear response automatic."

42. Quoted in Jonathan Tucker, "Gene Wars," *Foreign Policy*, Winter 1984-85, p. 76.

43. Piller and Yamamoto, p. 175, quoting Richard Novick, director of the New York Public Health Research Institute.

44. Feith, p. 83. Feith's conclusions have been widely shared by government and private analysts. In 1986, H. Allen Holmes, an assistant secretary of state for politico-military affairs, opined that "the Convention, in our judgment, cannot be made effective through amendment or design." (Cited in David Dickson, "Gene Splicing Dominates Review of Weapons Pact," *Science*, 10 October 1986, p. 143.) In 1985 the Defense Science Board on Chemical Warfare and Biological Defense concluded that "technology has made obsolete much of the distinctions and language of the BW treaty." (Dept. of Defense, *Biological Defense Program*, Report to the Committee on Appropriations, House of Representatives, May 1986, chap. 1, p. 6.) For the past five years, in numerous articles and books, Joseph Douglass, Jr., has been arguing that the Biological Warfare Convention is a dangerous illusion lulling the United States to sleep. See, e.g., the Douglass sources cited in notes 2, 6, & 11 and Joseph Douglass, Jr. and H. Richard Lukens, "The Expanding Arena of Chemical-Biological Warfare," *Strategic Review*, Fall 1984, pp. 71-80. For a contrary view, that the Biological Warfare Convention is not hopelessly obsolescent and could perhaps be salvaged, see Piller and Yamamoto.

45. Feith, pp. 83-84.

46. Michael Gordon, "Senators Prepare Sanctions Laws For Supply and Use of Poison Gas," *New York Times*, 24 January 1989, p. A8.

47. John Kester, "Chemical Weapons, Cloudy Thinking," *New York Times*, 13 January 1989, p. A31.

48. Russell Watson, "The Winds of Death," *Newsweek*, 16 January 1989, p. 25. Other leading experts echo Burns' point. "It would be extremely difficult to detect a deliberate violation of a chemical warfare [CW] treaty—extremely difficult," observed Thomas Welch, deputy assistant to the secretary of defense for atomic energy and chemical matters. (Cited in Dan Boyle, "An End to Chemical Weapons—What are the Chances?" *International Defense Review*, September 1988, p. 1087.)

Brad Roberts, a CW expert at the Center for Strategic and International Studies in Washington, is quoted as concluding: "A realist would have to say that the prospects for a meaningful chemical disarmament regime are dim." (Russell Watson, "Letting a Genie Out of a Bottle," *Newsweek*, 19 September 1988, p. 31.)

49. Charles Flowerree, "Elimination of Chemical Weapons: Is Agreement In Sight?" *Arms Control Today*, April 1988, p. 9.

50. James Markham, "Arabs Link Curbs on Gas and A-Arms," *New York Times*, 9 January 1989, p. A8.

51. See Watson. Judging from pledges made during the election campaign, President Bush is keenly interested in keeping up the momentum for a CW treaty. "If I'm elected president," he said, "if I'm remembered for anything, it would be this: a complete and total ban on chemical weapons. Their destruction, forever. That is my solemn mission." Paul Taylor, "Bush: Ban Chemical Weapons," *Washington Post*, 22 October 1988, p. 7.

52. U.S. Army Dept., Committee on Chemical and Biological Sensor Technologies, *Assessment of Chemical and Biological Sensor Technologies* (Washington: June 1984), p. 50. Chemical and biological warfare agents are divided into three categories: chemical (synthetic compounds), biological (live organisms), and toxins (biologically derived chemical substances). To defend against these agents, sophisticated sensors are needed to detect and identify minute concentrations. At present, the U.S. military has a number of fielded systems, ranging from battlefield vans to personal dosimeters, capable of monitoring *chemical* threats. There is no comparable capability for detecting biological or toxin agents, which can now be diagnosed only with microbiologic and/or serologic testing procedures available in clinical laboratories. Some studies are beginning to explore the possibility of developing biomicrosensors, i.e., detection devices based on an interaction between the suspected agent and a sensitive membrane—to remedy this defect. In addition, new developments in immunoassay techniques and gene probes offer some promise for enhanced detection of biological agents. The ultimate goal is to develop a multi-function "biochip" (the biological equivalent of an integrated circuit) capable of serving as the building block for a portable sensor system for biological and toxin agents.

53. Ikle and Wohlstetter, p. 9.

54. Robert Tucker, "Using Force Against Libya," *New York Times*, 11 January 1989, p. A23.

55. David Ottaway, "U.S. Officials See Insufficient Grounds to Justify Attacking Libyan Plant Now," *Washington Post*, 8 January 1989, p. A24.

56. Tony Capaccio, "New Exotic Germs on the Way," *Defense Week*, 16 May 1988, p. 15.

57. See, generally, Steven Shaker and Alan Wise, *War Without Men—Robots on the Future Battlefield* (Oxford: Pergamon-Brassey's 1988). According to the authors: "the opportunities for weapon superiority afforded by [new] technologies, as well as the increasingly dangerous battlefield environment, may eventually relegate man to the role of behind-the-scenes strategist, leaving machines to perform the actual fighting. If current trends continue, it is not a question of whether this will happen, but rather

how long it will take" (p. 6). They estimate that fully autonomous robots will be deployed on the battlefield within 20-30 years and comprise the "preeminent" force within 50-60 years. *Ibid.*, pp. 10, 73. Ironically, the expanding threat of biochemical weapons will likely spur on the development of such robotic systems.

58. Of course, not all of society's important battles take place on a battleground in the formal sense. The continuum in which soft weapons can be used reaches beyond battlefields and the military's traditional capabilities for defense.

To cite a current example, one of the most damaging weapons systems presently being directed at the United States is chemical warfare in the guise of narcotics. According to some analysts, the growing trade in drugs involves more than just an unbridled quest for profits. In their judgment, the drug lords are being assisted by terrorists and certain governments hostile to the United States, for political reasons. Illicit drugs are not only a source of easy wealth but also a potent and expanding means to sap the vitality of American society. As explained by a high-ranking Nicaraguan defector, who claimed to have first-hand knowledge about Cuban and Sandinista strategy: "Yankee imperialism [is] armed to the teeth, believing that the Soviet Union [is] going to attack the U.S. as part of a nuclear war. But the Yankees [do] not realize that the Yankee imperialism [is] going to perish, eaten from within by . . . the drug traffic and the economic competition with Japan and the European Economic Community . . . ." (Testimony of Alvaro Aviles before the Senate Subcommittee on Security and Terrorism, quoted in Rachel Ehrenfeld, "Narco-Terrorism and the Cuban Connection," *Strategic Review*, Summer 1988, p. 60.)

Communist competition with the West is grounded on a belief in the inexorable and favorable march of history. Accordingly, patience becomes an essential element of the all-assets struggle. Nudge and chip and nibble away, but stop short of provoking a cataclysmic showdown. Given that frame of reference, why should adversaries engage in formal war if, at relatively little cost, they can stimulate efforts to eviscerate our society from within?

Several authors note that, historically, both the Soviet Union and the People's Republic of China have not been reluctant to use drugs as a weapon. (See Douglass, *America the Vulnerable*, pp. 119-126; and Alvin Buckelew, "The Secret World of Narcoterrorism," *Security Management*, September 1987, pp. 69-73.) In his article Alvin Buckelew, a former senior U.S. intelligence officer who served in East Asia and Latin America, traces narcotics "warfare" against the West over a 40-year period. Phase one began in 1949 when Mao Tse-tung directed a flow of narcotics to U.S. occupation troops in Japan and later to American forces in Korea. Phase two started in the early 1960s when, impressed by Chinese success in using what Mao referred to as "indigenous chemical warfare," the Soviets decided to mount a similar—but much broader—campaign against the West. In late 1962, following the rebuff of the Cuban Missile Crisis, Nikita Krushchev set into motion a large-scale operation to infiltrate narcotics into major Western nations. His declared intent was "to accelerate the process of demoralization of bourgeois society" by weakening American youth (Douglass, p. 121).

Also targeted, as an extension of the overall strategy, were members of the armed forces. The cheap and plentiful supply of drugs available to service members in Vietnam and Europe during the late 1960s and 1970s was no accident. As described by Buckelew: "in the late 1960s, the major drug [supplied by China to American troops in Vietnam] was exceptionally potent marijuana dipped in opium to create addiction. Later, nearly pure heroin arrived in the vicinity of US bases in Vietnam, at or below cost (eighty cents a gram), while the supply of marijuana and other drugs dried up. The objective was clearly to stimulate heroin use by American troops" (p. 71).

During the last decade the U.S. military has made substantial progress to bring its internal drug problem under control. The growing travail of American society as a whole, however, suggests that at least one prong of the original Sino-Soviet drug initiative continues to thrive as a self-sustaining weapon that pays for itself. And there may yet be worse to come. Douglass notes that the Soviet bloc has developed at least a half-dozen new "recreational" drugs which are deemed, on the basis of tests on prisoners, to be even more addictive and debilitating than cocaine. For now, the Soviets have decided not to "market" these new drugs but instead to hold them in reserve for the right opportunity (Douglass, p. 55).

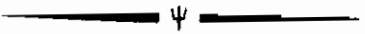
59. Quoted in Gary Thatcher, "Disease as an Agent of War," *Christian Science Monitor*, 15 December 1988, p. B3.

60. Since 1945, nations possessing nuclear weapons have been careful not to engage in direct wars with each other. Most of the fighting has been done via proxies. But now that some of the proxy states are also beginning to acquire weapons of mass destruction, this technique might eventually become too risky as well. Twenty years from now, if current proliferation trends hold up, the world could easily have 50 nations with significant nuclear, chemical and/or biological capabilities. In such an environment, as weapons of mass destruction continue to disperse throughout the globe, hot wars will be a tricky

business; and even the euphemistically named low-intensity conflicts may become carefully modulated duels with more political than military content.

To follow this speculative path one step further, *if* the world becomes increasingly locked up militarily, then economic competition will be ascendant, and "warfare" might shift from overt to more covert forms. What could eventually emerge as a darker side to this economic struggle is an intensified campaign of "dirty tricks"—a stream of soft weapons designed to sap an adversary's vitality: computer viruses, designer drugs, insect pests and, tapping the new potential of bioweapons, an array of enfeebling agricultural, animal and human disorders.

To the extent possible, this cool war would be waged out of the public eye and off the military mapboard. During the past 45 years, it is likely that the first salvos in such a clandestine campaign have already been launched—silently and without fanfare. The concept of social sabotage is not new. What is disturbingly new, however, is the growing potential for biological and toxin agents to serve as weapons in such a struggle.



Don't Be Surprised

". . . And it is the quintessence of naiveté to expect that peoples with histories radically different from ours will necessarily accept our political, social, economic and ethical values."

Henry M. Wriston:
Foreign Affairs, April 1962
(p. 382)